In the Claims:

Please amend the claims so as to read as follows:

1. (Currently Amended) A rising and moving apparatus, comprising:
a body;
~~a~~ an elastically deformable wing portion ~~elastically deformed by force exerted by surrounding fluid, to an extent that allows a body to hover and move~~ associated with said body;
a driving unit for driving the wing portion; and
a control unit controlling the manner of driving the wing portion by the driving unit, wherein
when driven by said driving unit said wing portion is elastically deformed by a surrounding fluid such that a lifting force is generated on said wing portion that causes said apparatus to rise, and said control unit controls the extent to which said apparatus rises in said surrounding fluid and also whether said apparatus hovers or moves in said surrounding fluid.

2. (Currently Amended) The rising and moving apparatus according to claim 1, wherein
said wing portion has an upper side and a lower side, said upper side having a greater torsional rigidity or flexural rigidity ~~of an upstream side of the fluid higher~~ than ~~the~~ a torsional rigidity or flexural rigidity of ~~the downstream~~ said lower side ~~of the fluid~~.

3. (Currently Amended) The rising and moving apparatus according to claim 1, wherein
said wing portion has a leading edge and a trailing edge, said leading edge having a greater torsional rigidity or flexural rigidity ~~on the side of a leading edge higher~~ than ~~the~~ a torsional rigidity or flexural rigidity ~~on the side of a~~ of said trailing edge.

4. (Currently Amended) The rising and moving apparatus according to claim 1, wherein

said wing portion has an upper surface and extends outwardly from said body in a span direction, said upper surface of said wing portion defining a wave plate structure ~~having~~ comprising alternating ridge lines ~~or~~ and valley lines extending along said span direction of the wing portion ~~is provided at an upstream side of the fluid at the wing~~.

5. (Currently Amended) The rising and moving apparatus according to claim 1, wherein

said wing portion includes a leading edge portion and extends outwardly from said body in a span direction, said leading edge portion defining a wave plate structure ~~having~~ comprising alternating ridge lines ~~or~~ and valley lines extending along said span direction of the wing portion ~~is provided at a leading edge portion of the wing~~.

6. (Currently Amended) The rising and moving apparatus according to claim 1, wherein

said wing portion includes an upper side portion comprising a self-supporting member or a non-self-supporting member and an associated support structure, and a lower side portion comprising a self-supporting member or a non-self-supporting member and an associated support structure, and a thickness of the upper side portion of said wing portion ~~on the upstream side of the fluid~~ is larger than ~~the~~ a thickness of the lower side portion of said wing portion ~~on the downstream side of the fluid, or a supporting structure of the wing portion at the upstream side of the fluid is thicker than the support structure at the downstream side of the fluid~~.

7. (Currently Amended) The rising and moving apparatus according to claim 1, wherein

said wing portion includes a front side portion comprising a self-supporting portion or a non-self-supporting portion and an associated support structure and a trailing side portion comprising a self-supporting portion or a non-self-supporting portion and an associated support structure, and a thickness of the front side portion of said wing portion ~~on the upstream side of the fluid~~ is larger than ~~the~~ a thickness of the trailing side portion of said wing portion ~~thickness of said wing portion on the side of a leading edge is larger than the thickness on the side of a trailing edge, or a support structure of said wing portion on the side of the leading edge is thicker than the support structure on the side of the trailing edge~~.

8. (Currently Amended) The rising and moving apparatus according to claim 1, wherein

said wing portion defines a first section adjacent to which a relative velocity of said surrounding fluid is high and a second section adjacent to which a relative velocity of said fluid is low, and an angle of attack of said first section of said wing portion to said surrounding fluid ~~where fluid velocity is relatively high~~ is smaller than ~~the~~ an angle of attack to said surrounding fluid of said second section of said wing portion ~~where the fluid velocity is relatively low~~.

9. (Currently Amended) The rising and moving apparatus according to claim 1, wherein

said wing portion defines a tip end furthest from said body and a root substantially abutting said body, and an angle of attack to said fluid ~~of said wing portion~~ at ~~a~~ said tip end is smaller than ~~the~~ an angle of attack to said fluid ~~of said wing portion~~ at ~~a~~ said root.

10. (Currently Amended) The rising and moving apparatus according to claim 1, wherein

said wing portion is rotatable about a prescribed center of rotation, and a flexural rigidity ~~of a portion relatively~~ of a first section of said wing portion ~~closer to~~center of rotation is ~~higher~~ greater than a flexural rigidity of a ~~portion~~ second section of said wing portion disposed further away from said prescribed center of rotation than said first section of said wing portion ~~relatively far from the center of rotation~~.

11. (Currently Amended) The rising and moving apparatus according to claim 1, wherein

said wing portion is rotatable about a prescribed center of rotation, said wing portion comprises a self-supporting member or a non-self-supporting member and a support structure, and a thickness of said wing portion at a ~~portion~~ first section thereof ~~closer to~~ is greater than a thickness of a second section of said wing portion disposed further from said prescribed center of rotation than said first section of said wing portion ~~is larger than the thickness far from said center of rotation, or a support structure closer to said center of rotation is thicker than the support structure far from said center of rotation~~.

12. (Currently Amended) The rising and moving apparatus according to claim 1, wherein

said wing portion is rotatable about a prescribed center of rotation and defines a first section and a second section, said second section being located further from said center of rotation than said first section, and a torsional rigidity of said first section ~~a portion relatively closer to the center of rotation~~ is ~~higher~~ greater than ~~the~~ a torsional rigidity of said second section ~~a portion relatively far from the center of rotation~~.

13. (Currently Amended) The rising and moving apparatus according to claim 1, wherein

said wing portion defines a leading edge, a trailing edge, a span direction extending outwardly from said body and an ~~is provided such that the~~ axis of rotation located along said span direction of the wing portion such that said axis of rotation is positioned approximately ~~in the middle~~ midway between the leading edge and the trailing edge of the wing portion.

14. (Currently Amended)The rising and moving apparatus according to claim 1, wherein

~~during a stroke reversal of said wing,~~ said wing portion has a lower surface, said control unit controls said driving unit such that said wing portion pivots upwardly and downwardly relative to said body in upward and downward strokes and during transitions between said upward and downward strokes said lower surface of said wing comes into contact with an upper portion of a vortex generated by the ~~flapping~~ motion of said wing portion immediately before said transitions ~~the stroke reversal~~

15. (Currently Amended) The rising and moving apparatus according to claim 1, wherein

~~during a stroke reversal of said wing,~~ said wing portion defines a curved upper surface having a first center of curvature and a curved lower surface having a second center of curvature, and said control unit controls said driving unit such that said wing portion pivots upwardly and downwardly relative to said body in upward and downward strokes such that elastic deformation of said wing portion occurs ~~so~~ in a manner such that a direction of extension of an axis of rotation of a vortex generated ~~by the stroke reversal~~ during transitions between upward and downward strokes of said wing portion substantially matches a ~~matches~~ direction of extension of an axis connecting the centers ~~of radii~~ of curvature of said upper and lower surfaces of said wing portion.

16. (Currently Amended) The rising and moving apparatus according to claim 1, wherein

said wing portion defines a root portion substantially adjacent to said body, and when said wing portion is driven by said driving unit, ~~a~~ said root portion moves upwardly and downwardly relative to said body periodically, and said wing portion elastically deforms such that said wing portion defines sections ~~has a portion having a different phase of periodic motion than the phase of the periodic motion at the root portion~~. that move upwardly and downwardly relative to said body out of phase with the movement of said root portion.

17. (Currently Amended) The rising and moving apparatus according to claim 16, wherein

said wing portion defines an outer tip and said wing portion elastically deforms such that a phase of motion of ~~a portion~~ sections located closer to said tip than said body where a relatively large fluid force is exerted is delayed ~~from~~ relative to a phase of motion of sections of said wing portion closer to said body ~~a portion~~ where a relatively small fluid force is exerted.

18. (Currently Amended) The rising and moving apparatus according to claim 17, wherein

said delay in phase is at most 1/2 of one period of said ~~flapping~~ upward and downward motion of said section of said wing portion closer to said tip.

19. (Currently Amended) The rising and moving apparatus according to claim 16, wherein

said wing portion elastically deforms such that a phase of the upward and downward motion of a tip end portion is delayed ~~from~~ relative to a phase of the upward and downward motion of a root portion of said wing portion..

20. (Currently Amended) The rising and moving apparatus according to claim 19, wherein

said delay in phase is at most 1/2 of one period of said ~~flapping~~ upward and downward motion of said root of said wing portion.

21. (Currently Amended) The rising and moving apparatus according to claim 1, wherein

a manner of control of said control unit controlling said driving unit and a manner of elastic deformation of said wing portion are related such that a prescribed parameter ~~related to flapping rise and~~ of movement of said wing portion has the optimal value in accordance with a result of fluid-structure interactive analysis.

22. (Currently Amended) The rising and moving apparatus according to claim 21, wherein

the prescribed parameter related to ~~flapping rise and~~ movement of said wing portion may be lift force generated by the ~~flapping~~ upward and downward motion of said wing portion relative to said body

23. (Currently Amended) The rising and moving apparatus according to claim 21, wherein

the prescribed parameter related to ~~flapping rise and~~ movement of said wing portion is a value obtained by dividing a lift force generated by the ~~flapping~~ motion of said wing portion by a torque necessary for driving said wing portion so as to generate ~~the~~ a desired lift force.

24 (Currently Amended) The rising and moving apparatus according to claim 21, wherein

the prescribed parameter related to ~~the flapping rise and~~ movement of said wing portion is the highest frequency of said driving unit necessary for realizing said ~~flapping~~ optimum upward and downward motion of said wing portion.

25. (Current Amended) The rising and moving apparatus according to claim 21, wherein

the prescribed parameter related to the ~~flapping rise~~ movement of said wing portion is a value obtained by dividing the lift force generated by the ~~flapping~~ upward and downward motion of said wing portion by an energy necessary for generating the desired lift force.

26. (Original) The rising and moving apparatus according to claim 1, wherein said wing portion satisfies the following relation, where f denotes flapping frequency, L denotes representative length, r denotes a distance from a portion having the highest stiffness, w denotes a load on a portion at a distance r from the portion having the highest stiffness, and d denotes a displacement generated at the portion that bears the load w exerted by the load w:

$$0.36 \times 10^{-8} < r^3 \times w/d/(L \times f)^2 < 4.48 \times 10^{-8}.$$

27. (Original) The rising and moving apparatus according to claim 1, wherein said wing portion has Young's modulus of 1.77×10^8 to 5.66×10^9.

28. (Original) The rising and moving apparatus according to claim 1, wherein said wing portion has Young's modulus of 2.5×10^8 to 2.0×10^9.

29. (Original) The rising and moving apparatus according to claim 1, wherein said wing portion has Young's modulus of 1.77×10^8 to 2.0×10^9.

30. (Currently Amended) The rising and moving apparatus according to claim 1, wherein

said wing portion has an outer tip end portion and a root portion substantially adjacent to said body portion, and stiffness of a prescribed portion of said wing portion gradually increases from said tip end portion of said wing portion to said root portion of said wing portion, in proportion to a square of a distance from the tip end portion of said wing portion to said prescribed portion.

31. (Withdrawn) A method of manufacturing a rising and moving apparatus, comprising:

measuring step of measuring physical values related to an actual structure of a wing of an insect;

numerical value giving step of giving numerical values to the physical values related to the structure;

structural model preparing step of preparing an equivalent numerical model of wing structure that can be regarded as equivalent to said actual wing, using said physical value related to the structure given in numerical values;

model varying step of preparing numerical models of a plurality of different wing structures in which stiffness parameter of the equivalent numerical model wing structure is varied;

motion measuring step of measuring physical amounts related to manner of flapping motion while the actual wing of the insect is caused to perform flapping motion;

motion model preparing step of preparing a numerical model of flapping motion in which the physical values related to the manner of flapping motion are expressed as numerical values;

motion step of causing a plurality of different types of numerical models of wing structures to perform flapping motion represented by the numerical model of flapping motion, respectively, in preset virtual fluid for analysis;

analyzing step of calculating, in said motion step, a numerical model related to the fluid of the virtual fluid and the numerical model related to the structure of the numerical model of wing structure, respectively;

wherein

in said analyzing step, fluid-structure interactive analysis is used in which behavior of the fluid and behavior of the structure including interaction therebetween are analyzed;

said method further comprising

wing portion manufacturing step of manufacturing a wing portion that is driven by a driving apparatus, using said plurality of different types of numerical models of wing structure obtained through said analyzing step;

wherein

in said wing portion manufacturing step,

a prescribed parameter of the numerical model related to the fluid of the virtual fluid and the numerical model of the structure of said numerical model of wing structure is extracted, and

said wing portion is manufactured using a numerical model of wing structure in which said prescribed parameter has an optimal value.

32. (Withdrawn) The method of manufacturing a rising and moving apparatus according to claim 31, wherein

said prescribed parameter is lift force generated at said numerical model of wing structure when said numerical model of wing structure is caused to perform said flapping motion.

33. (Withdrawn) The method of manufacturing a rising and moving apparatus according to claim 31, wherein

said prescribed parameter is a value obtained by dividing lift force generated at the numerical model of wing structure when said numerical model of wing structure is caused to perform flapping motion, by a torque necessary for driving said model of wing structure to generate the lift force.

34. (Withdrawn) The method of manufacturing a rising and moving apparatus according to claim 31, wherein

said prescribed parameter is maximum frequency of said driving unit necessary to cause said numerical model of wing structure to perform said flapping motion.

35. (Withdrawn) The method of manufacturing a rising and moving apparatus according to claim 31, wherein

said prescribed parameter is a value obtained by dividing lift force generated at the numerical model of wing structure when said numerical model of wing structure is caused to perform the flapping motion, by and energy necessary for generating the lift force

36. (New) A rising and moving apparatus, comprising:

a body;

an elastically deformable wing portion associated with said body;

a driving unit for driving the wing portion; and

a control unit controlling the manner of driving the wing portion by the driving unit, wherein

said control unit reciprocates said wing portion along a plane perpendicular to a direction of lift force generated by a flapping motion thereof for hovering and drives said wing portion in a different manner from a driving manner for hovering for moving said apparatus in a horizontal direction.

37. (New) A rising and moving apparatus, comprising:

a body;

an elastically deformable wing portion associated with said body;

a driving unit for driving the wing portion; and

a control unit controlling the manner of driving the wing portion by the driving unit, wherein

a lift force is generated on the wing portion of said rising and moving apparatus by elastic deformation of the wing portion.